

REMARKS

The Office Action dated January 17, 2007 has been received and carefully noted. The preceding amendments and the following remarks are submitted as a full and complete response thereto. Claims 1 and 36 have been amended to define the subject matter more clearly by clarifying that "a support surface" in the original claims means an outer surface of a support that is either a sensor or an optical waveguide. Support for the amended claims 1 and 36 can be found at the cancelled claim 6 and throughout the specification, for example, at page 4, [0008]. Claims 22-35 have been withdrawn from consideration in response to the restriction requirement. Applicants reserve the right to pursue these claims in a divisional application or if there is an allowable generic or linking claim. Claims 41 to 46, which specify the polymer in the outer surface of the support, have been added. Support for claims 41 and 46 can be found throughout the specification, for example, at page 14, [0035]. No new matter has been added with the amendments of claims. Claims 1-21 and 36-46 are pending in this application. Reconsideration is respectfully requested.

I. Rejection of Claims 8 and 10 under 35 U.S.C. §112, second paragraph

The Office Action has rejected claims 8 and 10 for indefiniteness because the term "substantial" recited in claim 8 is a relative term. Applicants respectfully disagree.

The rejected term “substantial” (or “substantially”) is permitted when serving reasonably to describe the claimed subject matter to those of skill in the field of the invention. See MPEP 2173.05(b). The Federal Circuit held that “substantially equal” is a term of degree, and that its acceptability depends on “whether one of ordinary skill in the art would understand what is claimed . . . in light of the specification,” even if experimentation may be needed. Seattle Box Co. v. Industrial Crating & Packing, 731 F.2d 818, 826 (Fed. Cir. 1984).

As explained in the specification, the removal of the solvent in the claimed method results in tightening the loosened polymer chains. The removal of the solvent can be done in various common ways, for example, drying off the solvent. See, e.g., Figures 4A and 4B; ¶[0049]; ¶[0055]-[0056]; and Example II. Therefore, Applicants respectfully submit that one skilled in the art would easily understand “substantial removal” means removing the solvent to a point where the loosened polymer chains are tightened. One skilled in the art could readily determine the extent of removing the solvent by observing whether the loosened polymer chains tightened. In view of the foregoing reason, therefore, Applicants respectfully request reconsideration and withdrawal of this rejection.

II. Rejection of Claims 1-12, 14, 17-19 and 36-40 under 35 U.S.C. §102

The Office Action has rejected claims 1-12, 14, 17-19 and 36-40 as anticipated by Singaram et al. (U.S. Patent Publication No. 2002/0106810: Singaram). The Office

asserts that Singaram teaches (1) sensing copolymer molecules immobilized on insoluble polymer matrix (reading on claims 1(a) and 36(a)); (2) the use of an interpenetrating (interlacing) copolymer which is water or organic solvent swellable (loosened) comprising copolymerizable sensor dyes (macromolecular indicators) (reading on claims 1(b)-(d) and 36 (b)-(d)). The Office further argues that the hydroxyethyl methacrylate (HEMA) hydrogels disclosed in Singaram would inherently tighten upon exchanging ethanol for water for instance, thereby reading on claims 1(e), 7, 8, 11 and 37. The Office also points out the sequential polymerization taught in Singaram, thereby reading on claims 3 and 39. Applicants respectfully disagree.

As an initial matter, Applicants wish to draw the Office's attention to the amended claim 1, which clarifies that "a support surface" in the original claim 1 is an outer surface of a support which is a sensor or an optical waveguide. Therefore, the amended claim 1 more clearly defines the claimed invention as a method for interlacing (1) a macromolecular indicator or a monomer thereof with (2) a polymer contained in an outer surface of the support which is either a sensor or an optical waveguide.

Unlike the claimed method, Singaram does not teach or suggest interlacing a macromolecular indicator or a monomer thereof with a polymer contained in an outer surface of a support which is a sensor or an optical waveguide. Singaram discloses a composite water or organic solvent compatible polymer matrix such as a hydrogel, which comprises sensing moieties containing the dye and quencher moieties. See paragraph [055]. The hydrogel polymers of Singaram can be multi-component

hydrogels which include interpenetrating networks (IPN). See paragraph [0171].

Singaram describes how to make the IPN polymers. See paragraph [0176]. According to Singaram, a network comprising the quencher is formed and then the network is swollen with a mixture of monomers including the dye monomer and a second polymerization is carried out. Id.

Therefore, in Singaram, the IPN is formed between a polymer containing a quencher moiety and a polymer containing a dye moiety. Since both the quencher and dye moieties are sensing moieties, the IPN polymer matrix taught in Singaram functions as a macromolecular indicator of the claimed invention. Therefore, the IPN structure of Singaram is formed with two indicator polymers without any involvement of an outer surface of the support. In contrast, in the claimed methods a macromolecular indicator is interlaced with the outer surface of the support. As a result, Singaram does not teach or suggest steps (d) and (e) of the claimed method.

In Singaram, the resulting IPN polymer matrix and the indicator polymer matrix appear to be mounted in a cell or be attached to an optional support. See paragraph [0187] (“A sensing polymer is mounted in the cell such that it is exposed on one surface to the excitation light and on the other to the process stream”); paragraph [0189] (“The sensing polymer which contains the dye and quencher may be attached to an optional support.”) However, Singaram is silent about a cell or an optional support comprising at least one polymer (step (a)), let alone changing the integrity of the polymer contained in the outer surface of the support to provide loosened polymer chains that form at least

one interlacing area on the outer surface of the support (step (b)). The sensing polymer may also be immobilized by an insoluble polymer matrix ([0169]). But again, Singaram does not disclose how that was done, much less that it was done according to steps (b) - (d) of the present claims.

The Office alleges that the teaching of Singaram, e.g., "the use of an interpenetrating copolymer which is water or organic solvent swellable comprising copolymerizable sensor dyes," reads on steps (b) to (d) of claims 1 and 36. In the claimed method, the polymer contained in the outer surface is loosened to form at least one interlacing area on the outer surface of the support. In Singaram, the network comprising the quencher is swollen with a mixture of monomers including the dye monomer and a second polymerization is carried out to produce the IPN hydrogel. See paragraph [0176]. As explained above, the network comprising the quencher which is part of the IPN polymer matrix functions as a macromolecular indicator. Therefore, the swollen polymer disclosed in Singaram is not contained in the outer surface of the support, but rather is part of the macromolecular indicator. Consequently, Singaram fails to teach or suggest changing the integrity of the support polymer to provide loosened polymer chains to produce an interlacing area on the outer surface of the support (step (b) of claims 1 and 36).

The Office similarly incorrectly contends that Singaram in paragraph [0151] teaches use of organic solvent to swell polymers. Contrary to the Office's assertion, Singaram teaches that the organic solvent is used to dissolve the polyhydroxyl analytes

of interest. See paragraph [0151]. The Office fails to point out where Singaram teaches the use of organic solvent to swell the polymer contained in the outer surface of the support.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP 2131. Because Singaram fails to teach or suggest each and every element of the claimed method (claims 1 and 36), Singaram does not qualify as an anticipatory reference. The remaining rejected claims are dependent from either claim 1 or 36. Since the independent claims 1 and 36 are not anticipated by Singaram, the remaining dependent claims, which by definition incorporate all the elements of the claims 1 and 36, are not anticipated by Singaram. Accordingly, reconsideration and withdrawal of the anticipation rejection are respectfully requested.

III. Rejection of Claims 1-21 and 36-40 under 35 U.S.C. §103(a)

The Office Action also has rejected claims 1-21 and 36-40 as obvious over Singaram in view of Daniioff et al. (U.S. Patent Application 2002/0090734: Daniioff) with evidence provided by Kwok et al. (2002 Polymer 45:4017-4027) and Colvin et al. (U.S. Patent Application 2004/0013204: Colvin). Applicants respectfully disagree.

As explained above, Singaram fails to teach or suggest (1) providing a support having an outer surface which comprises at least one polymer, wherein the support is either a sensor or an optical waveguide; (2) changing the integrity of the polymer to

provide loosened polymer chains that form at least one interlacing area on the outer surface of the support; (3) causing the macromolecular indicator to interlace with said at least one interlacing area on the outer surface of the support, or causing the sequential polymerization of said monomers to form polymerization products which interlace with said at least one interlacing area on the outer surface of the support; and (4) causing the loosened polymer chains to tighten to produce surface immobilized indicator molecules. Moreover, Singaram is silent about the need of interlacing the polymer of the outer surface of the support and the macromolecular indicator so that a primary function or characteristic of the support are substantially preserved after immobilization. Therefore, Singaram would not have motivated one skilled in the art to come up with the claimed method. Furthermore, Singaram fails to teach swelling the polymer on the outer surface of the support to interlace the polymer with the macromolecular indicator. Absent any contrary evidence, therefore, one skilled in the art taught by Singaram would not have had a reasonable expectation of success of interlacing the macromolecular indicator directly with the polymer of the outer surface of the support.

The secondary references, Daniloff and Colvin, do not cure the deficiency of Singaram. Daniloff was cited as prior art disclosing an indicator molecule comprising bis-carboxylate bi-boronate-anthracene. Colvin was cited as prior art which evidences that an optical sensing polyhydroxyl substituted polymer of Singaram comprising a bis-carboxylate bi-boronate-anthracene of Daniloff would contain at least some excimer regions.

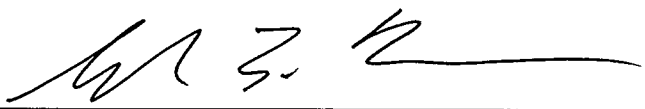
However, none of these secondary references teach or suggest non-covalently attaching a macromolecular indicator to a support which is either a sensor or an optical waveguide by interlacing the polymer of the outer surface of the support and the macromolecular indicator. Moreover, these references are silent about the need of interlacing the polymer of the outer surface of the support and the macromolecular indicator so that a primary function or characters of the support are substantially preserved after immobilization. Furthermore, these references fail to teach that the polymer on the outer surface of the support can be swollen to interlace it with the macromolecular indicator. Therefore, absent contrary evidence, one skilled in the art would not have had a reasonable expectation of success of interlacing the macromolecular indicator directly with the polymer of the outer surface of the support. Accordingly, even considering these references, the cited prior art references fail to motivate one skilled in the art to invent the claimed method with a reasonable expectation of success.

As explained above, the prior art references, alone or in combination, also fail to teach or suggest all the claim limitation of the rejected claims. Therefore, Applicants respectfully submit that the Office fails to establish a *prima facie* case of obviousness. Accordingly, reconsideration and withdrawal of the obviousness rejections are respectfully requested.

In light of the foregoing, Applicants believe that the all pending rejections have been overcome, submit that the instant application is in condition of allowance and respectfully request the allowance of the instant application.

If any additional fee is due in connection with the filing of this Response, please charge such fee to Deposit Account No. 02-2135.

Respectfully submitted,

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